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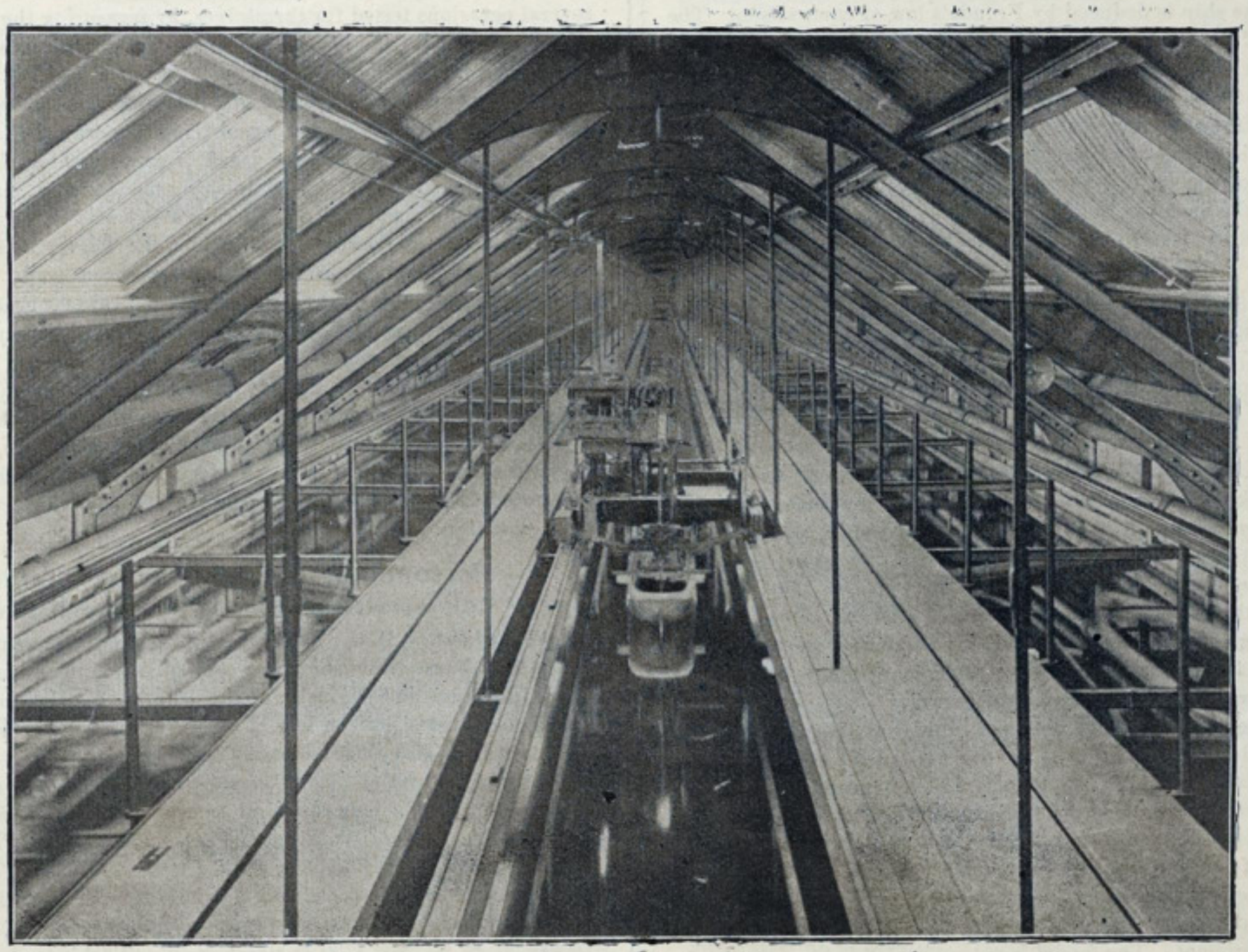
EXPERIMENTAL TANKS.

Their Advantages in the Progress of Ship Building in Other Countries—Benefits that Might be Derived in the United States.

Repeated efforts have been made by the navy department to secure from Congress an appropriation for a tank for experiments with models of ships, with a view to at least keeping pace with other countries in study of the question of resistance and speed, but as in many other matters pertaining to ship building, these efforts have failed, on account of a lack of a proper understanding of the benefits that would result from progress in this industry. With a view to calling attention to the great advantages that would be derived from an experimental tank in this country, there is printed on this page an engraving of the tank of Messrs. William Denny & Brothers, of Dumbarton, Scotland, which was taken from a picture in the exhibit of that company at the World's Columbian Exposition. The description of the tank and its operations was furnished by the famous scientific builders themselves, and can be relied upon as entirely accurate. One great draw-back in connection with the few tanks of this kind so far built throughout the world, is the manner in which the great mass of information obtained from them is buried as regards the distribution of scientific knowledge. Should the efforts of the navy be successful, there is no doubt that the builders of merchant vessels in the United States would be permitted to share the benefits, but it would seem, in consideration of the cost, which would be very light in comparison with the end in view, that the aim here should be to secure the construction of an experimental tank under conditions that would serve all interests, and that would bring about a distribution of the knowledge obtained from experiments with the hundreds of different models that might be considered.



THE DENNY EXPERIMENTAL TANK.

Many investigators from the earliest times down to the present day, have studied the question of resistance and speed of ships, and have endeavored to find the "form of least resistance," but until the late Dr. Froude commenced his investigations at Torquay in 1872, no one had been able to show, in a practical manner, the great value of experiments with models, and to predict with absolute certainty what horse power would be required to propel a ship of given design through the water at any speed. All this Dr. Froude was able to accomplish, and to demonstrate to the satisfaction of naval architects and engineers, in the numerous papers read by him before various institutions. For many years Dr. Froude carried on his investigations and did a lot of useful work for the British admiralty by testing war ship designs, and the admiralty has been so impressed with the value of the data obtainable from an experimental tank, that they have erected a splendid tank of their own at Gosport, which is under the superintendence of R. E. Froude, a son, and worthy successor of the late Dr. Froude.

Froude's method was adopted by the late Dr. Tideman of Amsterdam comparatively early, but up to the present Messrs. Wm. Denny & Brothers is the only private ship building firm in the world which has adopted the method. They constructed their tank as early as 1882, and made the first experiment in February, 1883, so that they have been accumulating valuable data for the last ten years, and stand in an exceptional position among ship builders and engineers, for it is perhaps not too much to say, that they are bound to be the best advisers in all matters relating to form and speed. They have made 40,000 experiments in their tank with 300 different forms of model, and when it is remembered that each experiment represents a double run of a ship on the measured mile, it can readily be imagined what a tremendous store of information they have as compared with other ship builders. As a sign of the times it may be noted that the Italian government have built an experimental tank at Spezzia, and the Russian government have almost completed one at St. Petersburg, and there are rumors of others to be built in other countries.

Messrs. Denny's tank is 300 feet long, 22 feet broad, and has 10 feet depth of water (being rather larger than Dr. Froude's tank, and smaller than the admiralty tank.) It was a happy thought of the late Dr. Froude's when the idea came to him to use parafine wax for his ship models, for it has many advantages over any other material. First, the models can be quickly made and tried. Messrs. Denny's staff can make and try a model in three days. Second, parafine wax does not absorb water, therefore the weight of the models remain constant. Third, modification in form can be easily made. Fourth, no material is wasted, for when a model is finished with, it is melted down for another, even the shavings and scrapings being gathered and melted down. The wax is melted over steam coils and run into a roughly prepared clay mould containing a "cove," so as to cast the model hollow. When cold, the casting is placed on the bed of a shaping machine, which is so designed that the operator can, by working two handles, cause a "tracer" to trace out any line on a drawing which may be attached to the machine, and this causes

a pair of high speed revolving cutters to cut a corresponding line on each side of the model. A number of "level lines" can be thus transferred from a drawing to a model, and the intermediate wax afterwards removed, and thus the model, which is usually about 12 feet long, is accurately shaped according to the design on the drawing. The shape is always tested carefully in the water, however, by what are called "needle trimmers." A number of needle points are set around the sides of the model, each point being a certain fixed distance from the keel, and then the weight of the model, plus the ballast necessary to make the points break the surface of the water, should agree with the calculated displacement to the plane of the needle points. In practice the agreement is found to be very close. The needles are then removed, and the and the model, (with a certain amount of ballast on board adjusted to give the required draught and trim,) is placed under the testing carriage. This carriage can be drawn at any speed (within wide limits) along a straight and level railway, which is about 18 inches above the water, the motive power being a stationary steam engine which winds an endless wire rope to which the carriage is attached. The model is hooked to a dynamometer on the carriage, and is thus drawn along at the same speed as the carriage, the force necessary to tow the model being registered on a revolving cylinder, by means of a pen attached to a multiplying lever of the dynamometer. The time and distance is at the same time being registered by two pens, attached to electric magnetic coils on the same cylinder. The time pen is actuated by a clock which makes electric contact and causes the pen to make a distinctive mark every half second. The "distance" pen is caused to make a distinctive mark for every 10 feet. The carriage travels, electric contact being made by means of a "trigger" projecting from the bottom of the carriage, and striking small blocks of wood placed at 10-foot intervals beside the railway. From the time and distance diagrams the speed of the carriage is ascertained, and from this the corresponding speed of the ship is deduced by Froude's law of comparison. The registered resistance of the model is also brought up to ship figures by Froude's law, which may be briefly stated as follows: "For similar forms, corresponding speeds are as the square root of the length and resistance at corresponding speeds are as the cube root of the length."

Suppose the ship is twenty-five times the size of the model, then 4 knots for the model would correspond to $4 \times \sqrt{25} = 20$ knots for the ship; and suppose the resistance of the model is 10 when going at 4 knots, then the resistance of the ship would be $10 \times (25)^3$ pounds. To ascertain the horse power required to propel the ship it is only necessary to find the number of foot-pounds per min., and divide by 33,000 thus: 20 knots $= \frac{20 \times 6,080}{60} = 2,026$ feet per min, and $\frac{2,026 \times 10 \times (25)^3}{33,000} = 9,600$, about. This is in practice subject to two corrections, the first being for density of water. As the model experiments are made in fresh water, the displacement and resistance of the model are too small in the ratio of the density of fresh water to salt water. The second correction is what is known as the "surface friction" correction, and is due to the well known fact that the surface friction per square foot of a short vessel is high compared with the surface friction per square foot of a long vessel, as the friction of the water along the surface of a vessel gradually communicates a more and more forward motion to the water, so that in a long ship the after part of the vessel has very little surface friction, compared with the forward part. A great number of special experiments were made with thin planes of various lengths, in order to get sufficient data to enable the "surface friction" correction to be made with accuracy.

After the net horse power has been obtained in the way thus indicated, an allowance must be made for the friction of the engines and the efficiency of the propeller, and here again Messrs. Denny Bros. are in an exceptional position, for they have secured this data for about 200 ships of various kinds, of single screw, twin screw and paddle wheel steamers. Although the measurement of speed and resistance of ship models is the primary purpose of the experiment tank, yet a number of other interesting and valuable experiments are made. We will first mention the measurement of the alteration in angle or trim of the model during the experiment. The model is not supported in any way by the dynamometer or any other part of the carriage, so that during the experiment the ends are free to rise and fall, and it is well known that at high speeds the bow of a ship rises and the stern falls. The amount of the rise or fall of the ends is measured by means of a self-recording apparatus at each end of the carriage, consisting of a vertical revolving cylinder, on which a pen, attached to a light rod resting on the model, is made to record the altered vertical height of the model.

Experiments are made with model screw propellers with another dynomometive carriage which supports the screw shaft or shafts at any desired immersion, by means of thin, sharp knife blades depending from a swinging frame, held in one direction by a spring, which is deflected by the thrust of the screw or screws. The deflection is magnified and recorded on a revolving cylinder. The turning force is also automatically registered on the same cylinder by a very ingenious arrangement, so that the efficiency of the propellers can be ascertained. The revolutions, time and distance are also registered by pens which are moved by electric contact. The propeller carriage can be connected to the ship model carriage, so as to make the screw or screws work in any desired position relatively to the model, or the screws can be tried separately by removing the ship model. The resistance of the knife blades, which carry the shaft, and the friction of the driving spindles have to be measured by an independent test, in order to apply a proper correction to the results.

Another important, though more recent development at Messrs. Denny's tank, has been the tests of efficiencies of paddle wheels of various designs. In 1887, Messrs. Denny contracted to build two high speed paddle steamers for the Belgian government, under most stringent conditions. The length was not to exceed 300 feet, the draught not to exceed 8 feet, 8 inches, the steamer was to be on level keel, and the speed was not to be less than 20½ knots. Absolute rejection of the steamer was to follow failure in any of these conditions. Nearly a dozen different designs to fulfill the conditions were tried in the tank at the Dumbarton works. The difficulty of the problem also caused the builders to make experiments with model paddle wheels with such success that they were able to exceed the guaranteed speed by more than a half knot, the actual speed of each steamer being 21.1 knots. Since that time experiments have been made with a great number of model paddle wheels for other vessels, and as a result Messrs. Denny are now famed for building high speed paddle steamers which burn very little coal. The model paddle wheels are driven by a small electro-motor, to which long vertical flexible wires are led, the current being drawn from overhead wires by means of a fixed arm attached to the experimental carriage. The thrust, turning force, and revolutions of the wheels are accurately measured in a somewhat similar manner to the method adopted for screw propellers, and by ringing the changes on size, number of floats, immersion, etc., the best design of wheel for a particular ship is ascertained. With a view to finding what is the actual immersion of the floats when running by the side of the model, the wave is very carefully measured, and it may be mentioned that the waves created by a model in passing through the water, exactly correspond to the waves created by the ship at a corresponding speed. The law of comparison is based on this fact, which Messrs. Denny have on several occasions tested for themselves, by measuring the waves of a ship on the measured mile and comparing them with those observed on the model. The agreement is wonderfully close.

It can be readily understood that the cost of conducting—apart from the first cost—such a large and varied number of experiments is quite an important item, as it not only necessitates a staff of experimenters, but workmen are constantly employed moulding and finishing models, and making alterations and additions to the apparatus, and there is also a staff of young ladies who have been trained to analyze the results, plot the curves and make drawings and tracings. Altogether there is a staff of seventeen hands constantly employed at experimental tank work. At first this appears to be an expensive luxury for a private ship yard, but on examination it will be found to pay, for sometimes great sums of money are saved by slightly altering the design of a ship, owing to the reduction in the size and power of the machinery, and if it pays the ship builder to make costly experiments of the nature described, how much more must it pay the ship owner to have an efficient ship, one that will burn very little c al and give him more cargo c pacity? Messrs. Denny deserve great credit for their long-sightedness in taking advantage of such an important invention.

Personell of the Light-house Establishment.

Special Correspondence to the MARINE REVIEW.

WASHINGTON, D. C., Aug. 17.—On account of numerous changes of late in the light-house establishment, a revised list of members of the light-house board inspectors and engineers of the different districts has been prepared for distribution under date of Aug 1, 1893. Following are names of members of the board with post-office addresses of each: Hon. John G. Carlisle, secretary of the treasury and ex-officio president of the board, treasury department, Washington, D. C.; Rear-Admiral James A. Greer, U. S. N., chairman, No. 2,010 Hillyer place, Washington, D. C.; Walter S. Franklin, No. 24 East Mount Vernon place, Baltimore, Md.; Prof. Thomas C. Mendenhall, superintendent United States coast and geodetic survey, Washington, D. C.; Col. John M. Wilson, U. S. A., war department, Washington, D. C.; Capt. George Dewey, U. S. N., No. 1730 H street, N. W., Washington, D. C.; Maj. Henry M. Adams, corps of engineers, U. S. A., war department, Washington, D. C.; Commander Robley D. Evans, U. S. N., naval secretary, No. 324 Indiana avenue, N. W., Washington, D. C.; Capt. Frederick A. Mahan, corps of engineers, U. S. A., engineer secretary, No. 1604 K street, N. W., Washington, D. C.

The inspectors in the lake districts are: Ninth district, Commander John J. Brice, U. S. N., No. 1,308 Chamber of Commerce building, Chicago, Ill.; tenth district, Commander James G. Greer, U. S. N., Post Office building, Buffalo, N. Y.; eleventh district, Commander William W. Meed, U. S. N., No. 80 Griswold street, Detroit, Mich. Major Milton B. Adams, U. S. A., No. 18 Bagley street, Detroit, Mich., is the engineer in charge of the ninth and eleventh districts, while in the tenth district the engineering work is under the direction of Col. Jared A. Smith, U. S. A., Hickox building, Cleveland, O.

The announcement of the appointment of a receiver for the Union Steamboat Company, which operates the big steamers Owego and Chemung, was a surprise in marine circles, as the line, which is the lake adjunct of the Erie railway, was known to be successful. It was explained later, however, that the move was made to stave off probable attachment on the property by creditors of the Erie, as that company owned the Union Steamboat Company stock.

Lake Freight Matters.

The time-honored custom of paying vessel freights in cash has, within the past few days, met with reversal. In a few cases, vessel owners have been compelled to accept on ore charters, part payment in cash and the balance in three-months paper. The number of such cases has been limited, but they serve to show that no branch of business is escaping the pressure for ready money. There is absolutely no sign of encouragement in the outlook for freights. A few shippers, who have contracts with vessel owners covering blocks of ore, have asked for and obtained extension in the time of delivery, but it can be said to the credit of the shippers that such cases are also rare. Advices from the head of Lake Superior are to the effect that northwestern grain is ripening earlier than for several years past, and will be ready for shipment in advance of the usual time, but this information affords little consolation when it is known that the leading shippers of the grain are at a loss to devise means by which money can be secured for moving it actively. The number of vessels going out of commission increases daily, while those held out for business meet with long delays in port, awaiting coal cargoes, which are necessary, even at the low rates, in order to keep out of debt in bringing down grain at 1¼ cents from Chicago, or ore at 50 cents from Lake Superior, and 40 cents from Escanaba.

Insufficient Assets.

In connection with the famous interview of July 4 last between Judge Stevenson Burke of Cleveland and Ferdinand Schlesinger, which has resulted in showing up the most disastrous financial tangle ever heard of in the lake region, a story is being told in iron mining circles that is very amusing, although it would hardly bear repetition but for the fact that the part taken by the Napoleon of mining finances was not at all serious. When Judge Burke had shown Schlesinger how far he had overstepped the bounds of business rights in misusing advances made by the firm of Corrigan, Ives & Co., he acknowledged his position and exclaimed:

"I have no farther desire of living. Will I shoot myself, judge, or will you shoot me?"

"No, thank you," the judge answered, "I don't think the assets would be sufficient."

Features in the Re-organization of the Chapin.

As had been expected for several weeks past, the creditors of the Chapin Mining Company, led by the Fire and Marine Bank, of Milwaukee, which holds as collateral a control of the stock of the company, are now in possession of the Chapin mine, and it is not probable that Ferdinand Schlesinger will ever again be heard of in connection with the management of the property. By the issuance of bonds, the purchase of which had been provided for before hand among the parties interested, the creditors have made arrangements for meeting unpaid labor and freight claims, for royalties, and for keeping the mine clear of water and moving the ore in stock pile as fast as it can be disposed of. The Chapins, who are the owners of the mine in fee simple, are party to the reorganization with other creditors, having agreed to an arrangement whereby a first mortgage, granted to the bank for having made advances to meet the urgent and immediate claims, is practically a lien on the mining fee.

This action on the part of the fee holders is considered very liberal, and would indicate that when mining is resumed under the reorganization it will be with a reduction of royalty, which seems inevitable if any ore from this big mine is to be marketed in future. Another feature in the affairs of the mine, which will probably demand a great deal of attention before operations are resumed, and to which a large part of the troubles of the company may be attributed, is the contract with the Menominee Transit Company, under which the six steel steamers of that company were built by the Globe Iron Works Company, of Cleveland, the builders having been paid from the sale of bonds secured by a mortgage on the boats, and the transit company holding a contract with the mine, which stipulates that the boats are to pay for themselves in carrying ore at $1.10 a ton from Escanaba. This contract, made in times of prosperity, has since been a great draw-back to the mining company, but it is, of course, valid, and a modification of it can be expected only in view of the extraordinary conditions that prompt expectations of reduced royalty. The plan of reorganization seems to indicate a determination on the part of the creditors now in charge, to secure a modification of the vessel contract, as well as the royalty now paid to the fee owners. Members of the firm of M. A. Hanna & Co., of Cleveland, control the affairs of the Menominee Transit Company, and the importance of the question of reducing the rate of freight in their contract, together with the uncertainty of any marked reduction being made in the royalty by the Chapins, may result in the mine being closed for a longer period than would be the case if the vessel contract did not exist.

Water Tube Boilers for Large Ships.

Of the various subjects discussed at the International Engineering Congress in Chicago last month, that of water tube boilers for large ships was probably of the most direct interest. The leading officers of the engineer corps of the United States navy showed a thorough appreciation of the importance of the subject, and it was generally agreed that the main question now in the development of the coil or tubulous boiler for big vessels pertains to the life of tubes. French engineers were given due credit for the progress which they have made with the new type of boiler, and in answer to the charge that officers of the United States navy are prejudiced against French boilers, the Belleville for instance, it was said that tha Belleville is a very heavy type of tubulous generator, and that it is expected that a better boiler will soon be produced.

English engineers seem to agree, also, that that the question of durability is most important. At a recent meeting of the British Institution of Naval Architects, Mr. J. T. Milton, chief engineer surveyor of Lloyd's Registry of Shipping, read a paper on this subject, that was most exhaustive and was highly commended by the institute. He, too, held that durability was the most important point to be considered, but spoke highly of the French boilers on this score, and was joined by his associates in admitting, at the outset, that Great Britain is indebted for experience to the French engineers, who successfully used these boilers before they were placed in any British vessel.

The use of water-tube boilers, instead of those of the ordinary types, the author said, has generally arisen from the desire of obtaining some or other of the following advantages. The relative importance of these not always being the same, has no doubt led to the various designs being adopted in different cases:

First—The means of obtaining higher working pressures than are practicable with ordinary boilers, owing to the excessive thickness of plates which would be necessary both for the shell and also for the heating surfaces.

Second—Economy of maintenance due to the comparative ease with which in some designs every part of the boiler, both external and internal, can be examined and cleaned, and if necessary renewed, it being with some types possible to entirely reboiler a vessel without opening deeks, &c.

Third—A decrease of space required, and also of weight of boilers and accessories necessary for producing a given power, or an increase of power obtainable with a given weight.

Fourth—It is also generally claimed for all classes of water-tube boilers that they are less liable than ordinary boilers to derangement or damage through accident or neglect; and also that, even in the case of rupture, the damage which would result would be much less than with ordinary boilers.

Important Features of Customs Laws.

A Canadian vessel putting into a port of the United States on the lakes for coal or supplies of any kind must enter and clear at such port, and the same requirements apply to vessels of the United States bound to or coming from a Canadian port. This rule may seem unnecessary, and it is undoubtedly violated in a great many cases, through a lack of knowledge on the part of either vessel masters or collectors of customs, but it is the law, nevertheless, as proven by some correspondence that has just come to hand. On June 8 last, Mr. George H. Hopkins, collector of customs at Detroit, wrote Secretary Carlisle, of the treasury department, as follows:

"I beg to enclose herewith a communication this day received from a coal dealer of this city. He states that the practice of this port, which requires a vessel from a foreign (Canadian) port to a United States port, which stops at this port to coal en route, to enter and clear, is not enforced in other districts upon the lakes, and that in requiring said entry and clearance the dealers here are discriminated against in their business, for the reason that vessel captains decline to put in here for coal, when they can avoid entry and clearance at other ports, and thus save the fee. If this statement be correct, I would ask if my interpretation of the law is incorrect, or if the instructions of the department set forth in decision 5,632 have been changed. If not, then I beg to suggest that it would seem unjust that the law should not be enforced at all ports alike."

In reply to the foregoing communication the department states that the Detroit collector is correct, and that the decision numbered 5,632 is still in force. This decision is dated March 30, 1883, and is as follows:

"A foreign vessel putting into a port of the United States, either on the seacoast, or northern and north-eastern and north-western frontiers, and taking on coal and other stores, must enter and clear in all cases, whether the stay be less than twenty-four hours or not. The only exception to this rule is that of a vessel in distress, when, instead of the usual entry, there will be made a protest under section 2,891, revised statutes.

"Coastwise vessels of the United States putting into port for coal and other stores will be governed by laws relating to the coasting trade, but such vessels arriving from or departing for foreign ports and taking coal and other stores must enter and clear."

In accordance with the latter paragraph in this decision a vessel of the United States taking coal from Cleveland to Port Arthur or grain from Chicago to Kingston, would be compelled to report and clear if stopping for fuel at Detroit or any other intermediate port of the United States.

Chicago Office of the Hydrographic Service.

In answer to an editorial in last week's issue of the REVIEW, relative to the aims of the new office of the hydrographic service at No. 1,621 Masonic Temple building, Chicago, George P. Blow, U. S. N,, in charge, says:

"The object and intention of this office is to assist the lake sailor, as we have already assisted the seafaring men on the Atlantic, Pacific and Gulf coasts. To do this intelligently, it is first necessary to learn a great deal of the conditions governing lake navigation, and we will depend upon the assistance and co-operation of the lake sailors to obtain this information. The advice contained in your editorial is most excellent, and the policy there outlined has always been the policy of the hydrographic office."

Mr. Blow invites masters of vessels to call at his office when in Chicago.

A Reputation for Honest Work.

We some time ago asked a well known ship builder of San Francisco how it was possible that Harland & Wolff's at Belfast had attained such eminence among European ship yards. His answer was: "I will illustrate it by a circumstance that happened not long ago. One of the White Star steamers was in port here, and the chief engineer wanted a door in his department divided transversely, so he could open the top part independently. We sent a man to cut the door in two, and when he had sawed into the edge a little way he struck iron. Thinking it was a nail or screw he turned the door around and sawed in on the other side, and again struck iron. We then examined the door, and found it contained an iron plate let into the stiles, and covered with wood panels outside. There was no sign of iron when the door was finished. It was careful, honest work, and that is what has built up the Belfast business."—Industry, San Francisco.

Stocks of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store at the principal points of accumulation on the lakes on Aug. 12, 1893:

	Wheat, bu.	Corn, bu.
Chicago	18,525,000	1,555,000
Duluth	3,815,000	.....
Milwaukee	1,069,000	3,000
Detroit	815,000	2,000
Toledo	1,178,000	76,000
Buffalo	1,395,000	373,000
Total	26,797,000	2,009,000

At the points named there is a net decrease for the week of 1,535,000 bushels of wheat and 10,000 bushels of corn.

Trade Notes.

The American Shipmasters' Association of New York, publishers of the Record of American and Foreign Shipping, classed during the past week the ship Aryan, screw steamer Knickerbocker, and three-masted schooner Mary Sanford, all American.

At Lorain, O., Mr. Ed. E. Fuller recently opened up the Lorain Machine and Repair Shops, which are located close to the several coal and ore docks at that port. The shops are equipped with machinery sufficient for ordinary repairs, and engineers will undoubtedly find it to their advantage to give Mr. Fuller a trial when needing repairs in Lorain.

The new 60-foot double-engine naphtha yacht Truant has just been delivered to her owner, Mr. H. L. Terrell, who will use her on the Shrewsbury river for the balance of the season, and send her to Florida later on. She is a marvel of comfort and elegance, and completely fitted for extended cruises. Her builders, the Gas Engine & Power Company, of Morris Heights, on the Harlem, claim she made over ten miles an hour on a long trip. Her power is two 12-horse power naphtha motors.

A supplement to the United States Standard Register of Shipping of New York, just issued, contains particulars of thirty-eight lake vessels, of which twenty-two have been built under inspection or classed under special survey, by the association publishing the register. Of these latter the greater number are big steel vessels like the Northern Line and Lehigh Valley steamers, Centurion Maritana, and others which are given star ratings for twenty and twenty-five years.

Another edition of H. R. Worthington's general catalogue, including illustrations of the firm's world's fair exhibit has been published. Engineers in charge of pumping machinery can secure one of the books by addressing W. D. Kearfott, No. 54 Frankfort street, Cleveland, O. It will be of interest to Americans to learn that Worthington pumping engines are to be used for the water supply of the city of Osaka, Japan. By the placing of this order there is literally a "girdle 'round the earth" of Worthington pumping engines, these machines having worked their way as far east as China up to the time of the awarding of this last contract.

The marine department of the Maryland Steel Works, Sparrow's Point, Md., was ably represented at the Chicago congress by Mr. Frank B. King. His discourse on the paper contributed by Consul O. Schlick of Hamburg, Germany, on vibration was masterly and interesting. Mr. King is a graduate of one of the polytechnic universities of Baltimore. After finishing his education there he entered the ship building works of Messrs. Wm. Cramp & Sons of Philadelphia, from which he subsequently withdrew to become the superintendent of the Columbian Iron Works and Dry Dock of Baltimore. From these works he became the manager of the more extensive plant of the Maryland Steel Works, where the Alabama, a fine specimen of naval architecture now running between Baltimore and Norfolk, was produced recently.

Iron Mining Matters.

The greatest falling off in Lake Superior ore shipments is, of course, in the movement from Ashland, the shipping port for the Gogebic range, where many of the smaller mines have suspended entirely and the larger properties are shipping only from stock piles. On August 6 a year ago there had been shipped from Ashland 1,132,914 gross tons, while this year the total movement on the same date was only 692,063 tons. Shipments from Two Harbors on the 9th inst. aggregated 536,670 tons, against 577,004 tons on August 6 a year ago, or a decrease of 40,334 tons. Although the figures from Marquette are not available, it is certain that that port, on account of its advantages over Escanaba in rail freights, has made a fair gain in shipments, which accounts for only a moderate general shortage in the movement from all Lake Superior ports. As the dock managers at Escanaba still guard the figures with great secresy, it is not possible to make even an estimate of the decrease in shipments from Lake Michigan, but it is reasonable to suppose that the difference is very large. Shipments from Two Harbors up to the 9th inst. were divided as follows: Chandler, 261,448 tons; Minnesota, 225,737; Zenith, 1,991; Cincinnati, 9,916; Canton, 21,449; Franklin, 14,929; Hale, 1,200. Shipments of Gogebic range mines through Ashland on the 6th inst. were: Ashland, 26,465 tons; Aurora, 103,901; Colby No. 2, 21,799; Tilden, 68,807; Germania, 4,975; Iron Belt, 7,544; Montreal, south vein, 1,347; Montreal, north vein, 21,175; Brotherton, 14,643; Comet, 5,035; Eureka, 20,867; Careys, 28,683; Newport, 61,309; Norrie, 134,215; East Norrie, 60,542; Pabst, 81,261; Jack Pot, 1,651; Davis, 7,515; Sunday Lake, 17,525.

Managers of the big Messabi properties have demonstrated their ability to mine ore with steam shovels, but the entire range is being hit very hard by the tight times. Not more than 60,000 tons has been moved from all of the new mines, and operations have been so generally suspended that shipments for ten days past have amounted to practically nothing. The Biwabik company is said to have expended about $100,000 for stripping a portion of the ore body before beginning steam shovel work, but it is probable that under the new method of mining this property, as well as a few others in the new district, would have shown big results if business conditions had been more favorable.

A Mass of Statistics on Iron Ore.

In the August number of the Cassier's Magazine, John Birkinbine, past president of the American Institute of Mining Engineers, has a second paper under the heading "From Mine to Furnace," in which he writes entirely of sources of iron ore supplies for the United States. Several engravings of mines, docks and machinery in the Lake Superior region, obtained from the Lake Superior Iron Company, Brown Hoisting and Conveying Company and other concerns around the lakes, are used in connection with the article, and the Lake Superior district is given prominence as the source of more than half of our supply. Regarding this feature of the subject, Mr. Birkinbine, who was in charge of work of the census bureau pertaining to iron ore, says that the ores from the different districts vary in the yield of iron, and it is therefore of interest to place the sources in something near their relative rank by estimating their probable percentage of the country's total output of pig iron. Such an estimate was prepared for the year 1887 and shows the proportions about as follows :

	PER CENT.
Lake Superior ores	44
Foreign ores	10½
Lake Champlain ores	6½
Cornwall ores	5
Alabama ores	5
New Jersey ores	4½
Tennessee ores	4
Missouri ores	3½
Virginia ores	3
Ohio ores	2½
Salisbury region	1
Georgia ores	½

On account of changes that have taken place during five years since 1887, it is estimated that probably 60 per cent of the pig iron is produded from ores obtained from the Lake Superior district, and those mined in the southern states of Alabama, Georgia and Tennessee furnish 17 per cent., while the foreign iron ores yield about 5 per cent., and the Cornwall ores 3 per cent. of the total pig iron output of the country.

Around the Lakes.

Jacob Johnson, whose death was announced from Chicago Monday, was closely identified with the lumber interests and owned several lumber barges. He was also a leading stockholder in the Chicago Towing Company.

Chicago tugs are having long runs after schooners during these dull times. Four of them were out six days last week before they finally returned with tows. Some of them were met over a hundred miles down the lake by passing steamers.

At the yard of the Chicago Ship Building Company, Colehour, Ill., a large part of the excavating work on the new dry dock has been done, but it is not being pushed as rapidly as it might be if business conditions demanded urgent operations.

Chicago's lumber fleet is suffering more than the big carriers from the stagnation of business, and it is said by men who profess to know that fully one-third of the schooners will be sold at marshal's sale to satisfy supply bills before the season is over.

On Saturday, August 26, Chicago will be the scene of the biggest yachting event ever held on Lake Michigan. The Lincoln Park Yacht Club will give an open regatta, and every yacht in port will be invited to enter. It is expected that there will be some twenty-five entries, and preparations are being made for a gala day.

Dispatches sent out from Ottawa a few days ago give statistics on Canadian shipping, from the annual list published by the department of marine. A lengthy summary of this report was published in the MARINE REVIEW of June 29, more than six weeks ago.

Martin Knudsen, keeper of the Port des Morts light house on Pilot island, was presented with a silver medal by Commander Brice, inspector of the Ninth light-house district. The medal was awarded by the secretary of the treasury for bravery in saving the lives of a woman and four men from the schooner A. P. Nichols, driven ashore in October, 1892.

A new life saving apparatus, consisting of rubber tubes which can easily be inflated, has been patented by Eugene J. Krieg, of Marquette, Mich., where the invention was given a test recently. It is to be manufactured in two grades, one for life saving crews and the other for travellers, to be carried with them when on the water. The advantages over a cork jacket claimed are many.

The four-masted schooner Yukon, built by F. W. Wheeler & Co., at West Bay City, was launched last week. She is 270 feet long, with 42 feet beam and 20 feet depth of hold. She is owned by Capt. William Forbes of Port Huron and Capt. Thomas Wilson, and will be managed by the Wilson Transit Company in connection with its fleet. She will be taken to Port Huron and remain there until business improves.

Few people in the vessel business are willing to believe the story that Capt. James Davidson, West Bay City ship builder, is making arrangements to construct five large wooden steamers during the coming winter. Capt. Davidson is probably able to undertake such a job, but notwithstanding the low cost of labor and material, he is shrewd enough to consider the question of overproduction in tonnage, which is playing a very important part in the present depressed condition of freights.

The schooner George B. Owen was launched at the Davidson shipyard in West Bay City last week. She is a beautiful craft, 205 feet in length and 34½ in breadth. The schooner has a raised deck forward, under which are a commodious forecastle and a pony boiler, steam windlass and pumps. She is steel strapped and has steel keelson plates. Her cabins are of hardwood finish. Her cost is $38,000, and she will carry a million feet of lumber or 55,000 bushels of wheat on 14 feet draft. She is owned by the Ketcham Steamship Company of Chicago, and will tow behind the steamer W. P. Ketcham, which is now building at the Davidson yard, and will be launched in about two weeks.

Although arrangements have been made between the Detroit Dry Dock Company and Capt. E. M. Peck of Detroit to suspend work on the big steel freight steamer on the stocks at Wyandotte, delaying the delivery of the boat until next spring, this does not mean that the steel plant of the dry dock company will be closed down for a great length of time. With the present outlook in freights, Capt. Peck is not in a hurry for his boat, and this fact, coupled with the condition of money matters, is the cause of temporary suspension. A change in the financial situation will undoubtedly cause a renewal of operations at the Wyandotte plant.

MARINE REVIEW.

DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

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The books of the United States treasury department contain the names of 3,657 vessels, of1,183,582.55 gross tons register in the lake trade. The lakes have more steam vessels of 1,000 to 2,500 tons than the combined ownership of this class of vessels in all other sections of the country. The number of steam vessels of 1,000 to 2,500 tons on the lakes on June 30, 1892, was 321 and their aggregate gross tonnage 534,490.27; in all other parts of the country the number of this class of vessels was,on the same date, 217 and their gross tonnage 321,784.6. The classification of the entire lake fleet is as follows:

Class.	Number.	Gross. Tonnage.
Steam vessels	1,631	763,063.32
Sailing vessels	1,226	319,617.61
Canal boats	731	75,580 50
Barges	69	25,321.12
Total	3,657	1,183,582.55

Tonnage built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

	Number.	Net Tonnage.
1888	222	101,102.87
1889	225	107,080.30
1890	218	108,515.00
1891	204	111,856.45
1892	169	45,168.98
Total	1,038	473,723.60

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

	St. Mary's Falls Canal.			Suez Canal.		
	1892.	1891.	1890.	1892.	1891.	1890.
No. vessel passages	12,580	10,191	10,557	3,559	4,207	3,389
Ton'ge, net regist'd	10,647,203	8,400,685	8,454,435	7,712,028	8,698,777	6,890,014
Days of navigation..	223	225	228	365	365	365

Entered at Cleveland Post Office as Second-class Mail Matter.

COMMANDER ROBLEY D. EVANS, naval secretary of the light-house board, spent a day or two on the St. Mary's river, and upon returning to Washington announced—if the dispatches quote him correctly—"that he would not recommend the expenditure of money for more lights on the river, as he deems navigation by night impracticable, on account of the swift current and narrow, crooked channel." He adds that the Hay lake channel, which is a cut-off of nine miles on the river, will be completed within two years, and will afford safe and sufficient navigation. With all due respect to Commander Evans' reputation as an efficient naval officer, it may not be out of place to call attention to the fact that in a single trip up the lakes, after less than a year of service on the light-house board, he could hardly be expected to master the question of navigation of the Sault river by night, which has demanded the attention of masters and owners of vessels for several years past. The statement that the river cannot be navigated by night, on account of its crooked, narrow channels, will not be accepted as argument when it is known that it has been and is now being run, largely on up trips, by a large number of vessels engaged in Lake Superior trade, and the practice would certainly be more general if a few more inexpensive crib lights were established at points where the present system is inefficient. This is all that is required, and the cost would be very light. Vessel owners have never asked for the elaborate system of lighting proposed by the board after the trouble of last season. The very low margin of profit in freights and the immense business of this river demand that, even for the two years intervening before the completion of the Hay lake channel, the present system of lights should be improved so as to at least meet the original plans, and admit of more general use of the river by night. But the present channel can not, by any means, be abandoned when the Hay lake work is completed. It has always been expected that when the new route is in readiness, there will be a channel for up-bound as well as down-bound boats. It would seem that Commander Evans should have given consideration to these points before being interviewed.

IN a paper on "Ocean Passenger Steamships," read at the International Maritime Congress in London a few days ago, Professor J. H. Biles expressed the opinion that the present progress with details would not bring about a large increase in speed. Radical changes in design will probably become a necessity. "The increase of power and size of ocean passenger ships, he said, made it more difficult to construct them so as to fulfill their principal requirement—that of safety. In order to insure safety, consideration must be given to strength, subdivision and stability. Generally it might be said that the strength of passenger ships was the element of safety which could most certainly be provided. As the desire for higher speed grew there would have to be an attempt made to insure as strong a structure as in the present ships with reduced weight, due to improved arrangements of material. Custom has stereotyped the present system, and though improvements in detail are constantly being effected, there will probably come a time when structures radically different from those at present in use will have to be adopted."

FOR the first time since the organization of the Lake Carriers' Association that body, at a meeting of its managers in Cleveland on Tuesday last, gave approval to plans for a bridge over an important navigable waterway. The structure is a combined railroad, street railway and foot bridge, which is proposed for erection between Rice's point in Duluth and Connor's point in West Superior. According to the plans, the proposed bridge seems free from reasonable objection, but in consideration of the determined position taken by the vessel interests of the lakes against obstructions of any kind in navigable highways, it should be the duty of the officers of the association to see that legislation pertaining to the erection of this bridge is surrounded by necessary safeguards. In any event it would seem that the precedent established at last Tuesday's meeting is somewhat dangerous.

SECRETARY FOSTER contemplates a radical reorganization of the coast survey, but will, it is reported, retain Prof. Mendenhall in his purely scientific capacity, placing some one in charge of financial and executive matters. The secretary couldn't make a better move, and while he has the change in hand, he will be rendering the vessel interests of the lakes a great favor if he will at the same time relieve Prof. Mendenhall of his duties in connection with the light-house board, where he showed, with other members of that body, a woeful lack of executive ability, in connection with the St. Mary's river lighting matter. Prof. Mendenhall may be a man of great scientific ability, but in the practical relations existing between the merchant shipping interests and the light-house board, the vessel owners of the lakes have found him a very poor executive officer.

ON A large number of lake vessels second mates have been dispensed with and crews otherwise reduced since depression set in. In no case, however, have economical methods been carried to extremes that would endanger life or property, and owners have considered their rights under the law. It is hardly necessary, then, to remind them that they are violatlng no law or custom in running vessels without second mates in dull times like the present. Still, it is to be hoped that improvement in freights will bring an early return of full crews and increased wages.

STATISTICS regarding the pig iron industry reflect most forcibly the enormous restriction in business generally. The latest statements indicate that the country is not producing much above 100,000 tons of pig iron a week, against 180,000 or 185,000 tons in active times, and in certain other lines of iron manufacture the decline is even greater.

Secretary Herbert's Plans.

Washington dispatches say that Secretary Herbert will advocate the construction of more ships. He will be conservative in his estimates, but he believes that the United States is still some distance from the point where it can afford to stop the work of ship construction. He has estimated that $11,000,000 will be required to complete the forty-two vessels, built and building, comprising the new navy. As this amount will be distributed over the next three years, he can advocate the addition of a ship or two each year during the present administration without adding materially to the annual appropriation for construction. He is on record as advocating a fleet of at least ten battle ships and said a short time ago that his views in that respect had not changed. He wants the new Congress to authorize the construction of at least one battle ship. It is understood also to be his intention to outline a definite policy as to just what the new navy should comprise.

Launch of the Minneapolis.

The Minneapolis, another big cruiser, was launched from the yard of Wm. Cramp & Sons, Philadelphia, last Saturday. She is a sister ship of the Columbia, being completed at the same yard, but the boilers have been changed somewhat from those in the Columbia, and as originally designed. She is 412 feet long, and 59 feet 2 inches beam, having a displacement of 7,475 tons on 24 feet draught. She must show a speed of 22 knots, and maintain a continuous steaming speed of 21 knots. Exclusive of armament she cost $2,690,000. The Bath Iron Works were the lowest bidders, but for several reasons the contract was awarded to Cramps.

Another British-Built Turret.

A second specimen of the turret-deck type of cargo steamer was launched on July 29 from the yard of Messrs. William Doxford & Son, Limited, Sunderland. The boat, which has been built for the same owners as the previous one, is named the Turretage, and has some improvements in detail as compared with her forerunner. Her dimensions are: Length, 311 feet; breadth, 38 feet 2 inches; depth, 24 feet 1 inch; with a load draught of 19 feet, a carrying capacity of 3,650 tons, a gross register of about 2,200 tons, and a net register of about 1,380 tons. The vessel is to be fitted with triple-expansion engines, having cylinders 23, 37 and 60 inches in diameter by 42 inches stroke, working with a steam pressure of 160 pounds.

In General.

The Lucania, sister ship of the Campania, has been delivered by the builders. She will leave Liverpool for New York early next month.

The smoke stacks of the new International steamers building at Philadelphia will be 100 feet high, higher, with a single exception, than those of any steamer afloat.

Among the first bills introduced in the Senate was one (S. 152) providing for the construction of a ship canal connecting lakes Union and Washington with Puget sound. It was referred to the committee on commerce.

On trial trips in England, W. K. Vanderbilt's yacht Valiant, built by Messrs. Laird Bros. of Birkenhead, attained a speed of 18.1 knots, under forced draft. She is the largest yacht in the world, being 2,400 tons. She has twin-screw engines of 5,000 horse power.

Mr. Balsamello of Rome, inventor of a sub-marine boat, claims that he can put grapnels and chains around the British battleship Victoria and raise her from a depth of 80 fathoms of water in the Mediterranean. He says the job can be accomplished for less than $200,000.

The famous Hudson River steamboat Mary Powell, recently made the run from New York to West Point, a distance of 50 miles, in 2 hours and 20 minutes. The machinery of this boat was built by Fletcher, Harrison & Co., North River Iron Works. —American Shipbuilder.

Navy department experts who have been considering the proposals for constructing a sub-marine boat, will probably visit Chicago to witness maneuvers of the Baker boat. The board has found the Holland boat superior in a number of points, but Mr. Baker hopes to overcome objections to his odd craft by having the experts see her in action.

A company in Liverpool, known as the Asbestos Tipped Lamp Wick Company, is making lamp wicks tipped with asbestos, and it is claimed that they are especially adapted to ships' lights. Tests are said to have shown an increase of at least 30 per cent. in the brilliancy of light, whilst one wick will last for at least thirty days without any trimming whatever.

Another big side-wheel steamer for the Fall River line was launched last week at the yard of the Delaware River Iron Ship Building Co. at Chester, Pa. The boat is 426 feet long on water line and 440 over all, or 20 feet longer than the Puritan. Her hull is 52 feet 6 inches wide and her extreme breadth over guards is 93 feet. Her draft will be 12 feet 5 inches and her total displacement 4,550 tons.

The Cunard officials at Glasgow profess to be highly satisfied with the trial trip of the Lucania, the sister ship of the Campania. On her preliminary trial she made 25½ land miles an hour. It is claimed that defects covered in the construction of the Campania were avoided in the Lucania. Her hull is better bound together and shows none of the vibration that accompanies the working of the Campania's engine.

At the International Marine Congress in London, a short time ago, M. Plate, chairman of North German Lloyd's, said with regard to the necessity of twin screws, that some of the best shipbuilders in the world were averse to their adoption, but the public demanded them, and, therefore, he had determined for his line that they should be adopted. Duplication of machinery gave safety, and was more important from the fact that sails could not now be set.

Immediately following the decision of Secretary of the Navy Herbert, in favor of all Harveyized plates for naval construction, the Carnegie Steel Company began arranging for the erection of forty Harvey furnaces in addition to the eighteen now in use. Preparations are also advancing for the erection of an additional armor plate mill, of a size that will handle the very largest plates with ease. It is stated that part of the requisite machinery will be purchased at Whitworth's works in England.

Patents of a Marine Nature.

Specially reported from the office of the U. S. commissioner of patents.

500,717—Ship's bell clock, by John S. Negus, Brooklyn, N. Y.; filed Sept. 17, 1892. Serial number 446,150; issued July 4, 1893.

500,780—Pile planting, by August Simon, Gnadau, Germany; filed March 3, 1893; serial number 464, 629; issued July 4, 1893; patented in Germany July 30, 1891, and in Belgium April 11, 1892.

500,818—Dredging apparatus, by James Price, Jr., San Fructuoso, Uruguay; filed Aug. 15, 1891; serial No. 389,105; issued July 2, 1893.

500,855—Boiler, by Barzilla J. Coller, Detroit, Mich.; filed Feb. 1, 1893; serial No. 460,625; issued July 4, 1893.

500,870—Flood gate, by Henry H. Eatherton, Monticello, Ill.; filed April 14, 1893; serial number, 470,274; issued July 4, 1893.

501,020—Dumping scow, by Bernard A. Mullen, Philadelphia, Pa.; assignor to Adolph Segal and Herman Hoopes, same place, and the Mullen Dredging and Lightering Company of New Jersey; filed June 15, 1892; serial No. 436,878; issued July 4, 1893.

501,122—Dredging machine, by John E. Walsh, New York, N. Y., assignor to Mary A. Walsh, same place; filed Feb. 3, 1893; issued July 11, 1893.

Copies of specifications accompanying these patents can be had at 15 cents each on application to the MARINE REVIEW, 516 Perry-Payne building, Cleveland, O.

Official Numbers and Tonnage.

The bureau of navigation, E. C. O'Brien commissioner, assigned official numbers and tonnage to the following lake vessels during three weeks ending August 12: Steam—Thomas Cranage, Port Huron, Mich., 2,219.52 tons gross, 1,855.59 net, No. 145,648; D. T. Helm, Chicago, Ill., 64.37 tons gross, 32.19 net, No. 157,378; Henry Gust, Milwaukee, Wis., 37.50 tons gross, 18.75 net, No. 96,236; Harry Bloom, Detroit, Mich., 30.86 tons gross, 15.85 net, No. 96,241; Bobert Downer, Buffalo, N. Y., 25.35 tons gross, 12.68 net, No. 111,037; Sultana, Detroit, Mich., 77.26 tons gross, 54.08 net, No. 116,583; Laura S., Chicago, Ill., 20.06 tons gross, 14.39 net, No. 141,293; U. C. Me., Detroit, Mich., 11.28 tons gross, 5.64 net, No. 25,294; Nettie Baker, Buffalo, N. Y., 13.24 tons gross, 7.83 net, No. 54,509; Peerless, Sandusky, O., 76.84 tons gross, 50.12 net, No. 150,637; Ralph M. Cooper, Milwaukee, Wis., 27.42 tons gross, 17.92 net, No. 111,038; Moselle, Oswego, N. Y., 12.47 tons gross, 6.24 net, No. 92,534. Sail—Avorset, Cleveland, O., 31.48 tons gross, 29.91 net, No. 107,043; Yukon, Port Huron, Mich., 1,602.69 tons gross, 1,522.56, net, No. 27,656; Emily Taylor, Milwaukee, Wis., 55.52 tons gross; 52.75 net, No. 136,386; Hawthorne, Chicago, Ill., 29.88 tons gross, 28.39 net, No. 96,242; Neva, Cleveland, O., 17.20 tons gross, 16.34 net, No. 130,641. Unrigged—Huron, Detroit, Mich., 210.82 tons gross, 200.28 net, No.42,739.

Tips From the Man on the Dock.

I have frequent talks with vessel owners now-a-days. These victims of the great panic of '93 are ever ready to air their misfortunes. They are all "in the same boat," and have come to the conclusion that, as prophets, they are not in it. They are like our soldiers of the late war who were shot through by minnie balls—it was done so quickly they didn't know what hurt them. Vessel owners can scarcely realize the change that has taken place during the past four months. In March last I had a talk with a prominent vessel owner. It was a warm afternoon, and we were sitting on a spile down below Smith's tug office. He said, "I tell you we are going to have a big season, and I have just bought two more vessels on the strength of it. Look at the immense amount of stuff to move. Lumber more than ever was known, and a million tons more coal than last year, for the stocks of coal above are all consumed by the hard winter; at least as much iron ore as last year, and as for grain, there is thirty-three million bushels in the elevators ready to move, with ten millions more in sight a little way back. Then the world's fair business will keep the railroads employed in carrying passengers, and leave all the grain for the vessels. I tell you we will have a big season." I saw this man again the other day, and asked him what about the "big season" he had prophesied. He said that on account of the panic he was unable to deliver it, and acknowledged that he had come to the conclusion that he was neither a prophet nor the son of a prophet.

* * *

It is said that McDougall's invention of "whale pigs," that have cut such a figure in our lake tonnage, was the result of a dream. The present condition of lake freights is not the result of a dream. No man foolish enough could have been found four months ago to imagine, much less to dream, that ore freights would, by mid-summer, fall off 50 per cent. from the contract rate for 1893. This contract rate was considered so low that no vessel owner filled up with it, and many rejected it in toto. Now it looks like a fair price to carry ore, and they are the fortunate owners who have secured some of it. Had it not been for the panic that has restricted business through inability of the banks to furnish the needed funds, we would have, in my opinion, a good season's business. The prophecies of vessel owners, reasoning from experience and the evident facts of supply and demand, would have been fulfilled. But the unexpected has happened, and a new factor has been introduced into the account which hereafter, in forecasting the future, can not be lost sight of in the vessel business. All the vessels running at the present measly low rates are not paying expenses. They will be able to discover it, I think, when all their bills come in. To tie them to the dock is the best thing now to save loss, and for the benefit of business later on.

* * *

Let me return again to the sectional wheel question. I was sunning myself one fine morning on the edge of a dock where a steamer was being unloaded. Presently appeared under her stern a float bearing a wheel blade, and a number of men in blue overalls with wrenches, hammers, etc., arrived later. Then I noticed that one blade was broken off the boat's wheel and I thought I would watch the method of replacing it. The wheel having been turned to a convenient point, the wrenches were applied and every nut, especially on the driving side, was found to be loose. This seemed to me conclusive evidence that that blade had struck something; the more so when on turning the wheel again to permit the stub of the blade to come away, one of the other blades was tried but the nuts were tight and solid. However, the new blade was set in its place and the nuts screwed, but it seemed to me that with large nuts of the kind in use not much could be done by two men simply pulling on the end of a 3-foot wrench. If it had been my job I should have wanted to see the sledge used on the wrench, so that there would have been nothing left to get. But I was only a spectator and said nothing. I was not surprised to learn, however, when next this boat appeared, that the same blade had become tired and dropped off.

Early Lake Navigators.

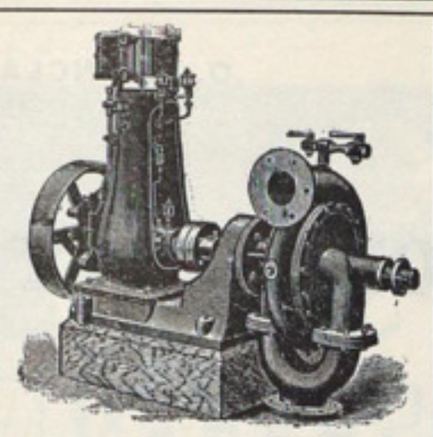
[*Continued from Vol. 8, No. 5.*]

"Capt. J. T. Pheatt came from the lower lakes. On the upper lakes he commanded the steamer Gen. Harrison, in 1840, (log cabin times) the steamer India in 1842, the Northern Indiana and Western Metropolis. Capt. John Stewart sailed, for the late Oliver Newberry, several vessels,commencing at an early period, the schooners Marengo, LaSalle, brig Manhatten and others. We also pay a passing tribute to the memory of other lake pioneers, among whom were Capt. Sam. Vary, who died at Sheboygan a few years since; 'Ould Ned Burke,' as he was widely known; Jerry Oliver, who commanded the steamer New England besides sail vessels at other periods; Captains Paine, Mann, Joe Sherwood, John Kline, also Capt. John W. Webster, who, with Capt. James Hackett, light-keeper at the mouth of Detroit river, are the two oldest vessel masters at present (1872) living. Capt. W. P. Stone, once of the steamer Keystone State, and favorably known, died at a hotel in New York city. Capt. Thomas Richards died while in command of the steamer Niagara, at Milwaukee, in 1849. Capt. G. W. Floyd came from the seaboard and sailed the brig Indiana in 1837. Capt. C. H. Ludlow in 1849 commanded the steamboat Baltic. Capt. Jacob Imson, of the Hendrick Hudson, Diamond, Buckeye State and propeller St. Joseph, went to farming in Michigan. Capt. S. Clement went into business in Chicago. He in 1839 sailed the schooner Philadelphia, besides the Atlantic and other of Ward's steamers. Capt. E. B, Ward was also at an early date a vessel man, sailing, among others, the schooner Gen. Harrison. The first steamboat he commanded was the Huron, in 1840. Capt. Fred S. Wheeler commanded the propeller Hercules and the steamboat St. Louis. Capt. D. P. Nickerson came from the seaboard and has filled numerous important positions both on salt and fresh waters. Capt. Morris Hazard came from the east, having an experience on the rivers. He brought out the steamer Milwaukee, at Buffalo, in 1838, and afterwards commanded the Constellation, and Empire State. Capt. D. H. McBride died at Milwaukee. The schooner Harve was the last vessel he commanded, in 1842, and the propeller Ironsides the last steamer. He was second mate of the steamer Erie, which was burned on Lake Erie in 1841, and narrowly escaped being counted among the lost. Capt. Wm. Hinton, for several years past pilot on the U. S. steamer Michigan, was first officer of the Erie when she burned, and also had a narrow escape. Capt. James M. Averill an old lake man, commanded the steamer Erie (the little) in '40 or '41 and subsequently sailing vessels, the Barton and others. Previous to this the captain was several years at sea. Capt. Jacob Travers commanded the steamer Golden Gate. Capt. Benjamin A. Stannard commanded numerous sail crafts. Capt. John Caldwell, who died at Cleveland in 1864, commanded, in 1836, '37 and '38, the schooner Hudson, afterwards the Henry Crevolin and Trenton. Subsequently for several years he commanded steamers on Lake Superior, and in the Northern Transportation Line. Capt. B. G. Sweet's lake career dated back to 1831, sailing the schooner N. C. Baldwin in 1837-8. He commanded the propeller Phœnix in 1846, burned on Lake Michigan in November of that year. He also sailed the Northerner, North Star, propeller Iron city and others. Capt. D. Howe, in his day quite prominent on the lakes, was a lower lake man, and sailed at one time the schooner Saratoga. In 1837 he was in command of the steamer New York, which craft was bedecked with four pipes. In 1840, Capt Howe was in command of the Chespeake, and in 1844-5 the Empire, at that date the mammoth of the lakes. Capt. J. S. Benjamin died at Prairieville, Mich, in 1864. He sailed the steamboat Ben. Franklin in 1849, and previously sail vessels out of Cleveland."

Capt. W. H. Rounds, marine insurance broker of Chicago, is certainly entitled to mention among early navigators. He was born at Sackett's Harbor in 1823 and commenced sailing in 1839 on board the schooner Genl. Brown. In 1841 he was in the schooner A. Wilcox, in 1842 the schooner Madison, and the following seven years were divided between the schooner Wilcox and propeller James Wood. In 1853 he went in the Delaware and in the Nile the next two years. He commanded the Free State and the Fountain City during the nine years before he went into the insurance business in Chicago, having sailed the propeller Milwankee two seasons since. He has been connected with the Aetna Insurance Company for twenty-five years.

Tom Coe of the Cleveland City Forge and Iron Company can also be included among the "old timers," having been connected as engineer with a number of boats mentioned, and having been shipmate with some of the captains already spoken of. He mentions Capt. L. A. Pierce, who was in the Southerner and Nile in 1848-9, and several years later in the Forest City between Detroit and Cleveland, and who was really the originator of the Detroit and Cleveland line. Among other boats of these times he recalls the Sebastopol, Missouri and Vermillion, built at Vermillion, and the Rochester, Bunker Hill and Troy. During the winter of 1845-6 the old States navigated Lake Erie, notwithstanding the ice. Mr. Coe corrects the dates given in Capt. Hall's book in several instances.

Centrifugal Pumping Machinery



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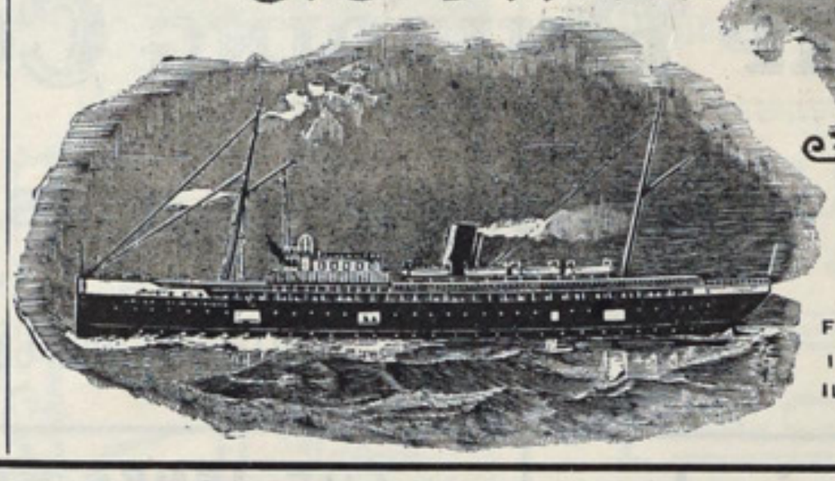

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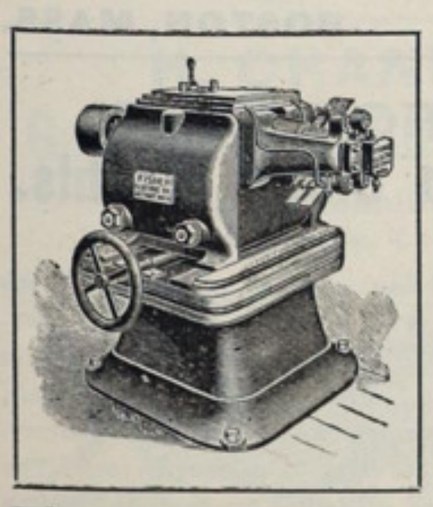

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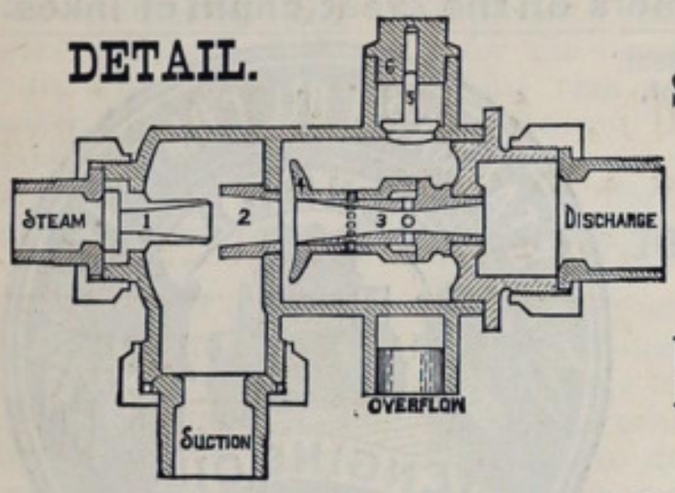

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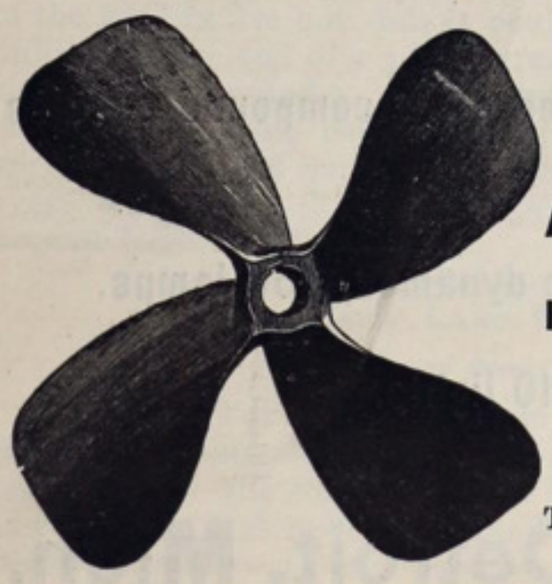

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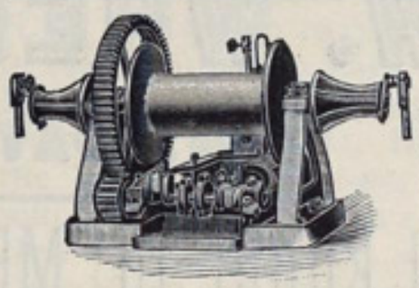

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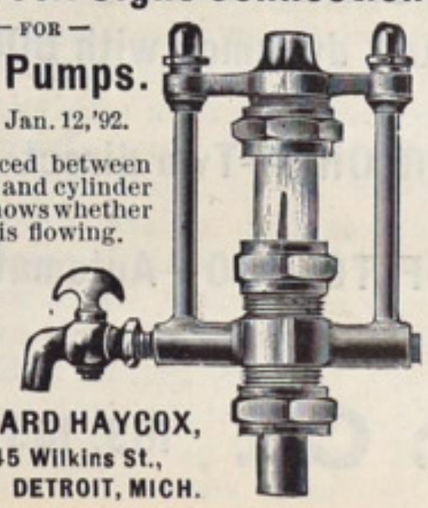

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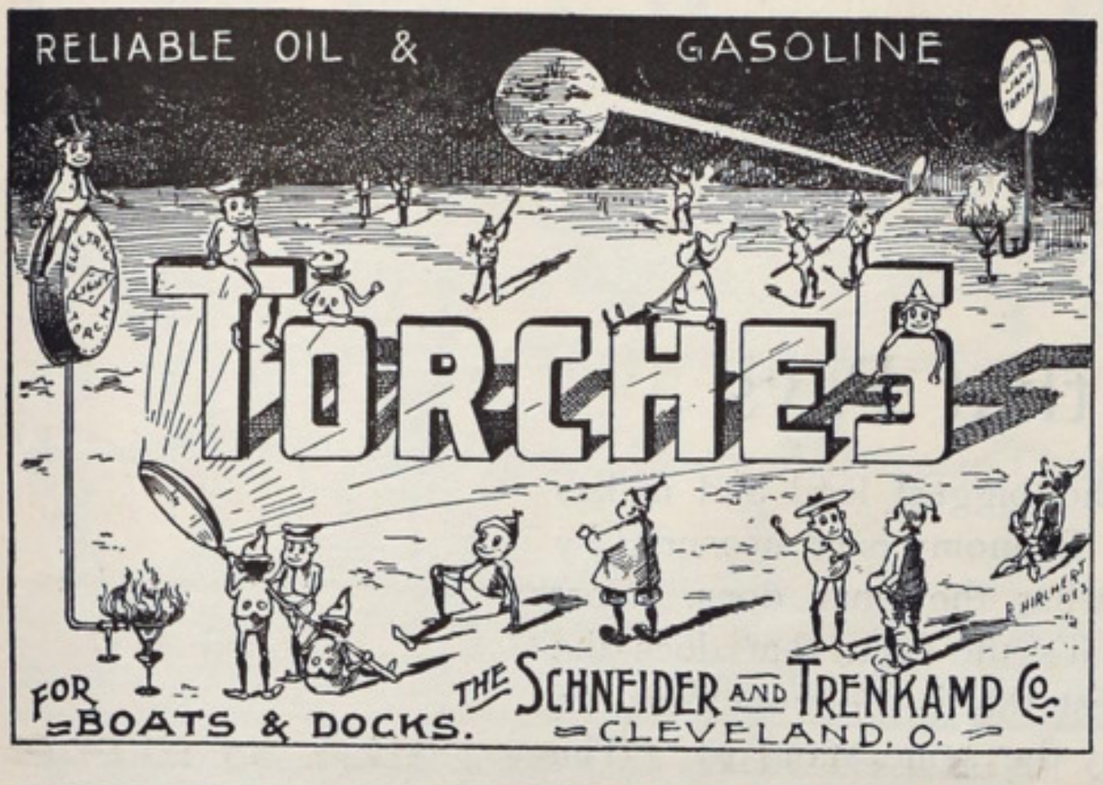

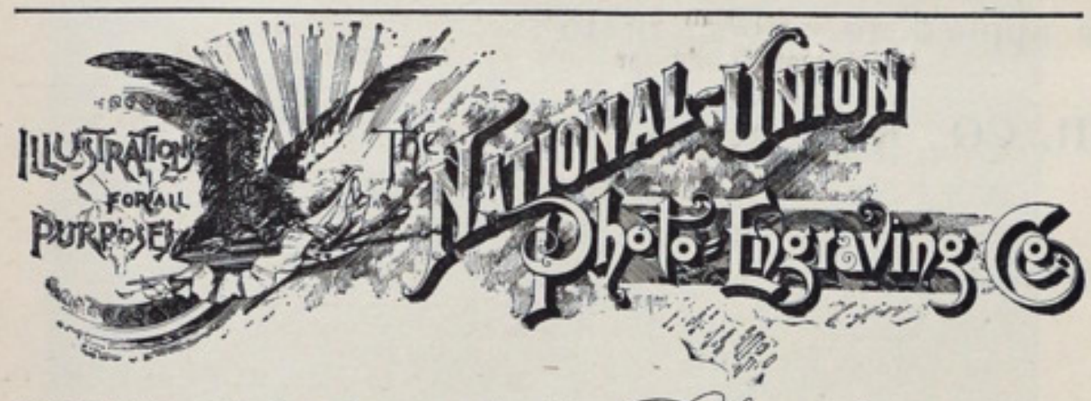

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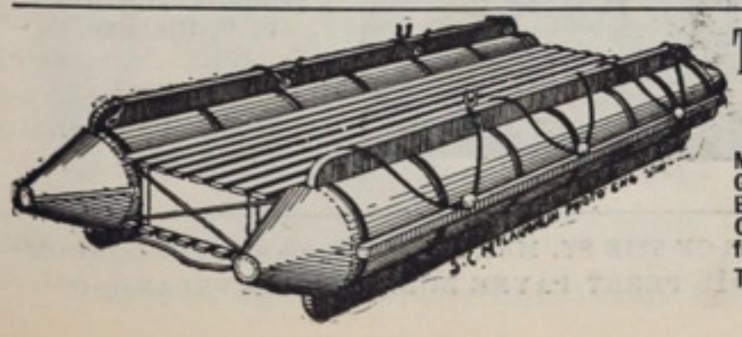

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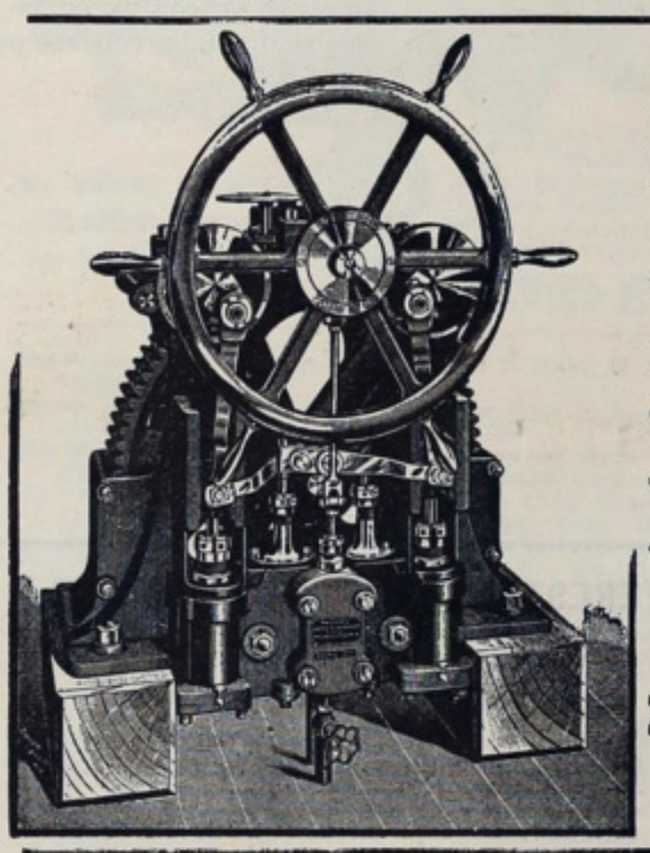

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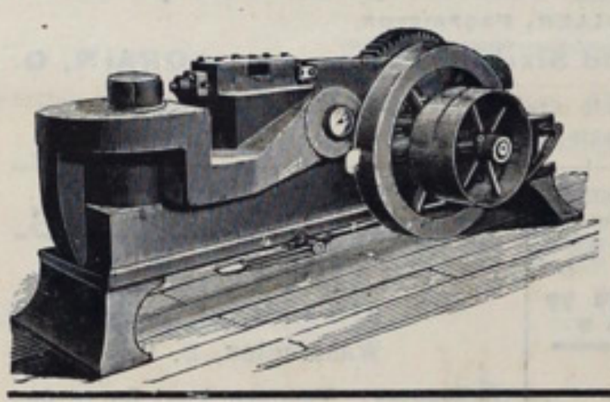

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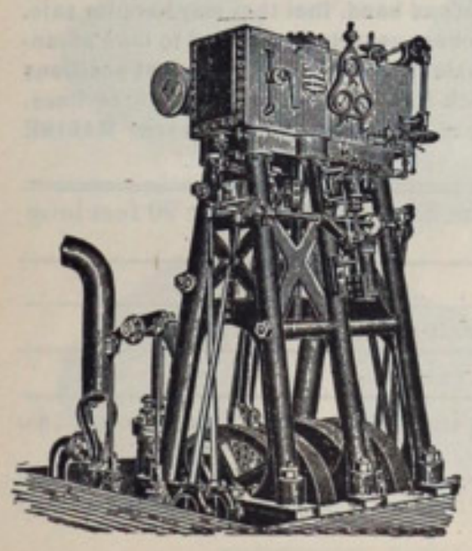

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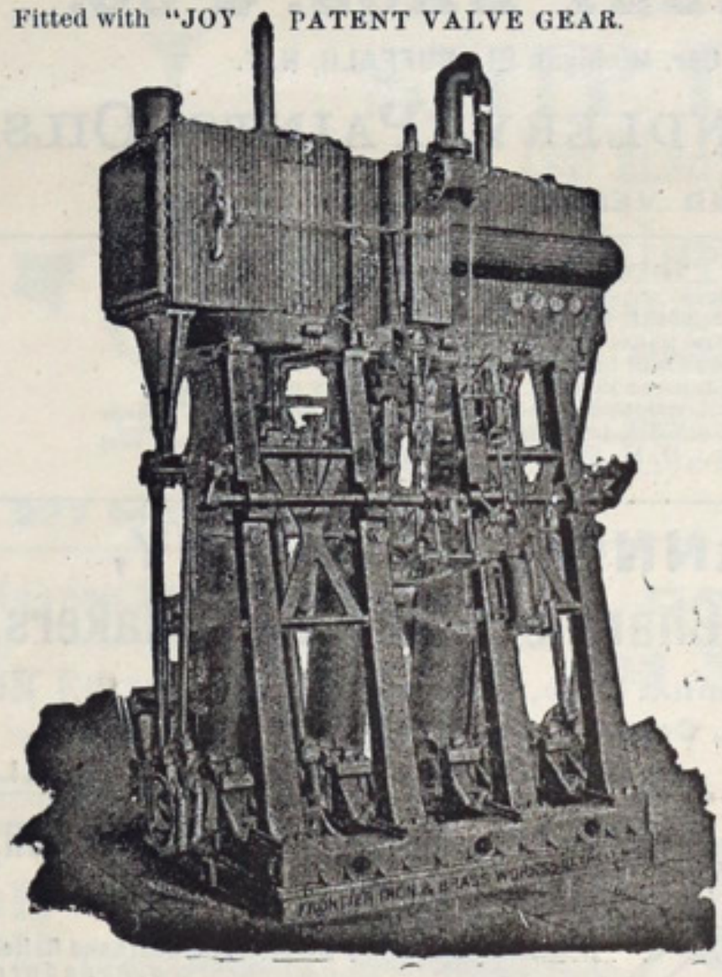

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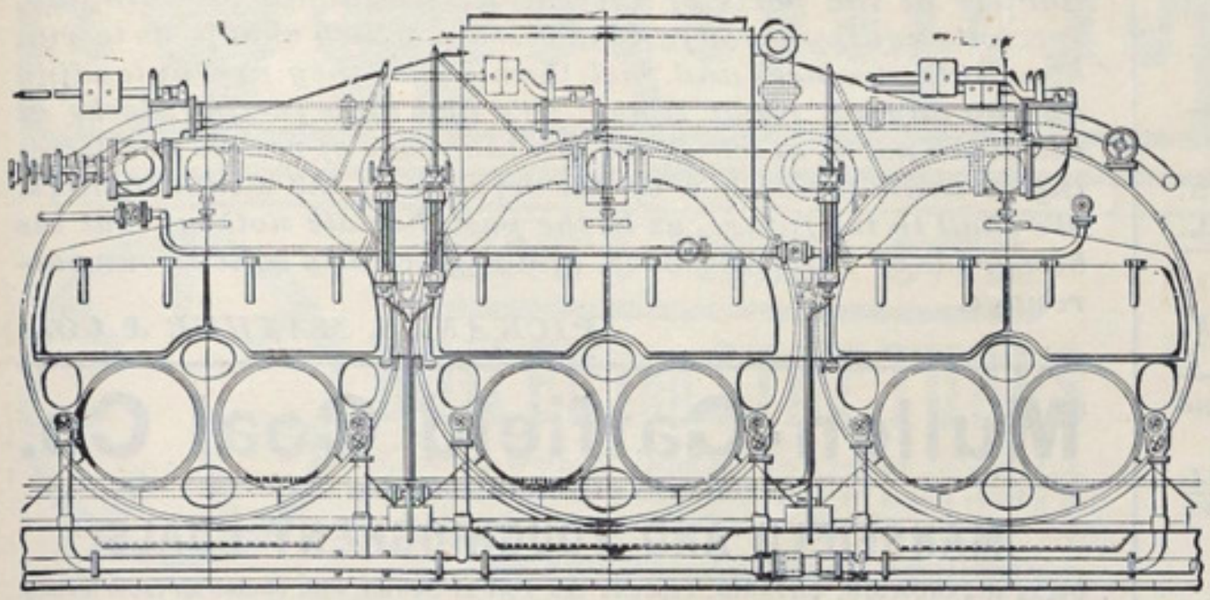

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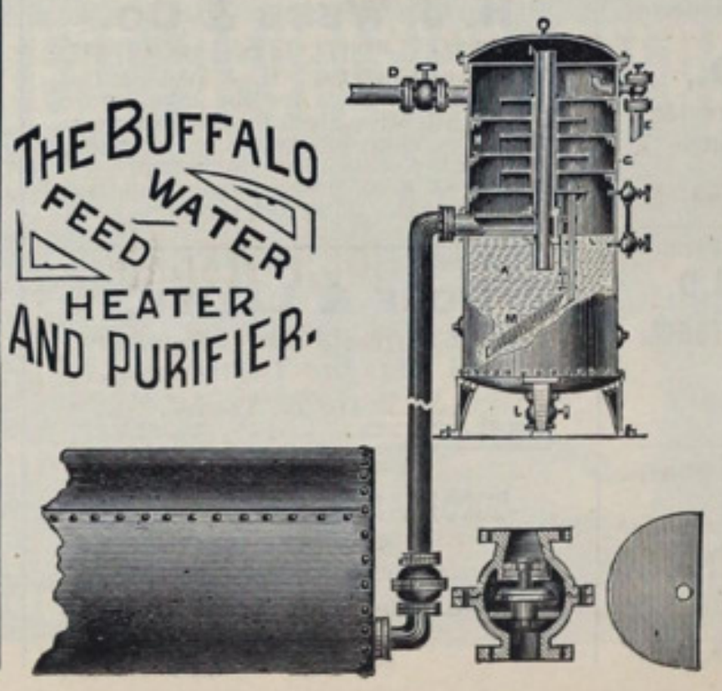

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C.—Feed pipe to boil
D.—Steam pipe.
E.—Water supply pipe.
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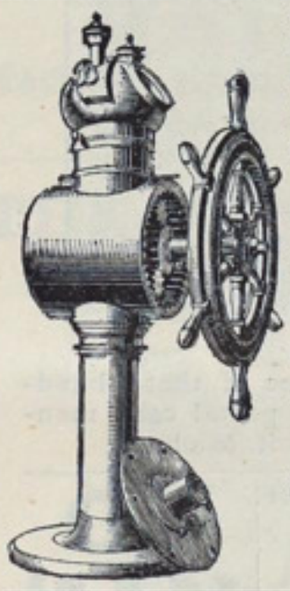

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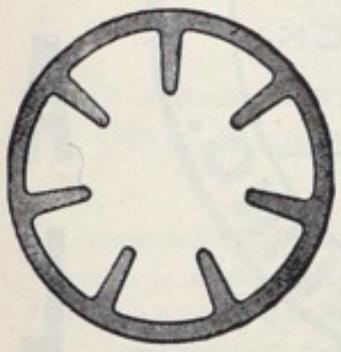

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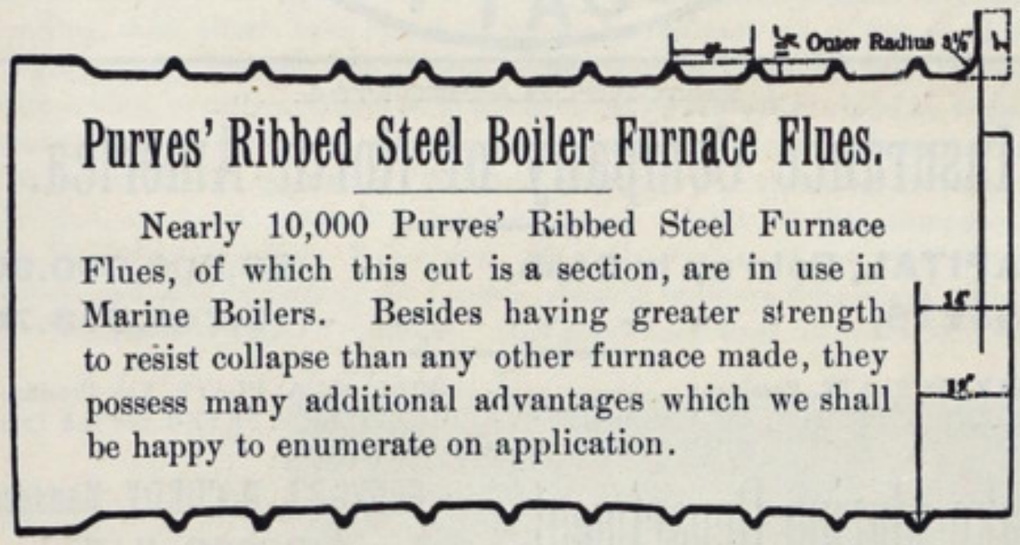

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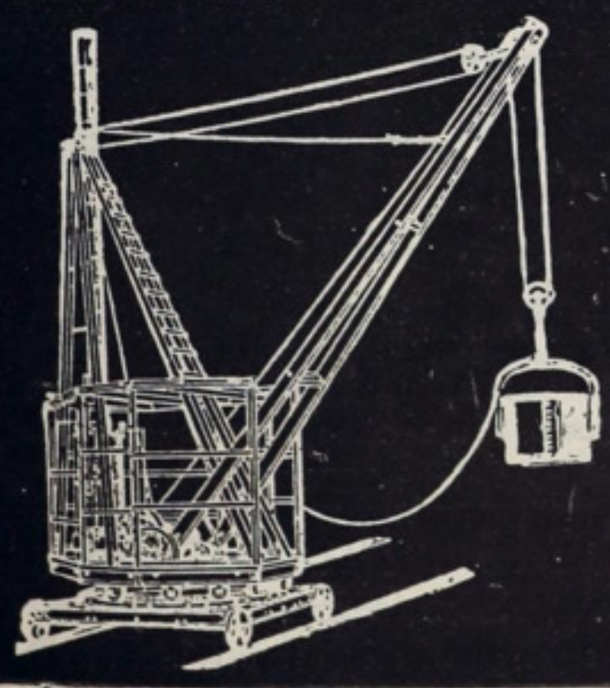

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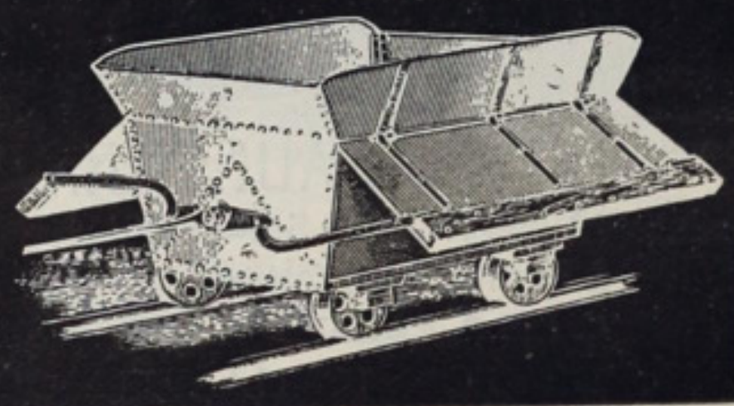

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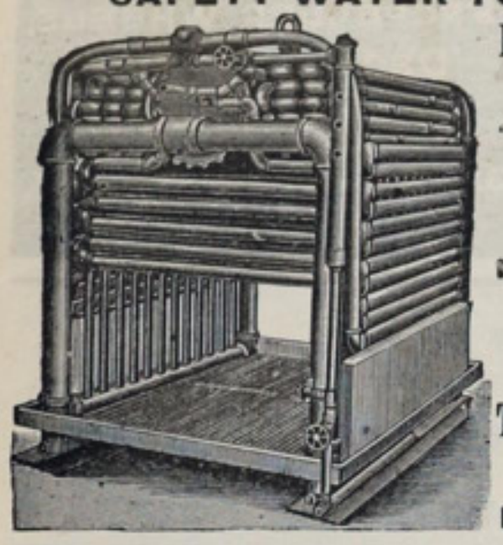

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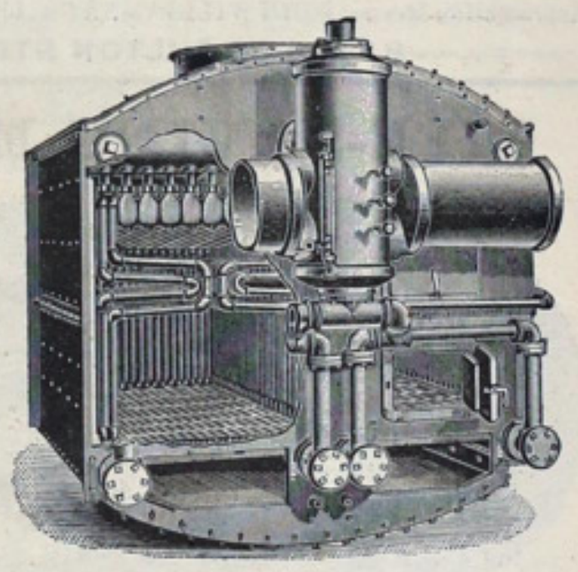

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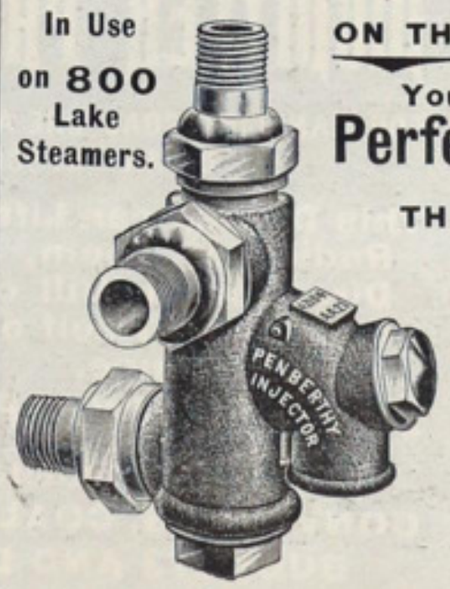

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